

PRE-PAGING INDICATION IN ATI AND PSI**FIELD OF THE INVENTION**

[0001] The present invention relates to an apparatus, a method, a system, and a computer program product related to improving the setup of a call. More particularly, the present invention relates to an apparatus, a method, a system, and a computer program product for improved setup of a terminating service in case of a terminating calls.

BACKGROUND OF THE INVENTION**Abbreviations**

[0002] 3GPP 3rd generation partnership project
[0003] ATI AnyTimeInterrogation
[0004] CSI Camel Subscription Information
[0005] DP Detection Point
[0006] GMSS Gateway Mobile Switching Center Server
[0007] GPRS Global Packet Radio Service
[0008] GSM Global System for Mobile Communication
[0009] HLR Home Location Register
[0010] LTE Long Term Evolution
[0011] MAP Mobile Application Part
[0012] MSS Mobile Switching Center Server
[0013] PRN ProvideRoamingNumber
[0014] PSI ProvideSubscriberInfo
[0015] SCP Service Control Point
[0016] SRI SendRoutingInformation
[0017] T-CSI Temporary CSI
[0018] TS Technical Specification
[0019] VLR Visiting Location Register
[0020] VT-MSS Visiting Terminating MSS
[0021] A typical mobile terminated call involves a gateway MSS (GMSS), an HLR, a VLR and a visiting terminating MSS (VT-MSS). The VLR and the VT-MSS may be physically the same network element. GMSS receives the incoming call from another mobile or fixed switching exchange. GMSS interrogates HLR by a MAP-SendRoutingInformation (SRI) message for a roaming number and terminating services of the subscriber. HLR further sends a MAP-ProvideRoamingNumber (PRN) to the VLR where the subscriber is actually registered. Then the VLR reserves a roaming number (MSRN), which is transferred back to the GMSS, which then can route the call to the VT-MSS. Normally, the paging of the subscriber over the radio network happens in this phase by the VT-MSS (referred as “normal paging”).
[0022] However, if GMSS and HLR both support the pre-paging functionality then they indicate this in the SRI and PRN operations to the VLR and then VLR initiates the pre-paging (referred as “PRN pre-paging”) of the subscriber before the roaming number reservation. In this case the radio resources are kept reserved until the call is routed to the VT-MSS. This is standardized functionality according to 3GPP TS 23.018 and 29.002.
[0023] If the subscriber has terminating intelligent network (IN) services indicated in HLR then HLR may first return these services to the GMSS without sending PRN to the VLR. The GMSS triggers the service towards an SCP, which can initiate a query for the subscriber’s current location. The query is a MAP-AnyTimeInterrogation (ATI) message to the HLR, which then sends a MAP-ProvideSubscriberInfo (PSI) to the VLR. The VLR in this case initiates a paging (referred as “PSI paging”) for the subscriber, because the exact location

of the user can be detected during an established radio contact. After the subscriber responded the paging request, the radio resources are released immediately and VLR responds with the location information to HLR, which then responds to SCP, which then responds to the GMSS. Then GMSS initiates another SRI operation for the roaming number and the message flow goes as described above. This is also standardized functionality according to 3GPP TS 23.078 and 29.002.

[0024] As it can be seen in the above situation (the subscriber has terminating services, which require the current location of the user), the subscriber is paged twice in the same terminating call, which wastes radio resources. For this reason, according to a not-standardized implementation, the pre-paging type of functionality in the VLR is implemented also at PSI operation (referred as “PSI pre-paging”). In this case the VLR and VT-MSS do not release the radio resources after the subscriber’s current location is determined, but keep the connection alive until the call is finally routed to the VT-MSS (just like in PRN related pre-paging). A relevant difference between PRN and PSI related pre-paging is that PSI does not include any indication about the pre-paging support, but it is triggered by the VLR based on an internal configuration parameter.

SUMMARY OF THE INVENTION

[0025] It is an object of the present invention to improve the prior art.

[0026] According to a first aspect of the invention, there is provided an apparatus, comprising checking means adapted to check, upon receipt of a detection point of a service for a subscriber, if a pre-paging support is related to the service; interrogating means adapted to interrogate a location of the subscriber, wherein the interrogation comprises an indication of the pre-paging support if the result of the checking by the checking means is affirmative.

[0027] In the apparatus, the interrogation may not comprise the indication of the pre-paging support if the result of the checking by the checking means is not affirmative.

[0028] According to a second aspect of the invention, there is provided an apparatus, comprising checking processor adapted to check, upon receipt of a detection point of a service for a subscriber, if a pre-paging support is related to the service; interrogating processor adapted to interrogate a location of the subscriber, wherein the interrogation comprises an indication of the pre-paging support if the result of the checking by the checking processor is affirmative.

[0029] In the apparatus, the interrogation may not comprise the indication of the pre-paging support if the result of the checking by the checking processor is not affirmative.

[0030] According to a third aspect of the invention, there is provided a service control point comprising an apparatus according to any of the first and second aspects.

[0031] According to a fourth aspect of the invention, there is provided an apparatus, comprising deciding means adapted to decide if a received interrogation for a location of a subscriber comprises a pre-paging support indication; location requesting means adapted to request a location of the subscriber upon receipt of the interrogation, wherein the request for the location comprises the pre-paging support indication if the deciding by the deciding means is affirmative.

[0032] In the apparatus, the request may not comprise the pre-paging support indication if the deciding by the deciding means is not affirmative.